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Collaborative Mentoring for Retaining Secondary Biology Teachers †

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Veteran biology teachers are at risk of leaving the classroom due to burnout, feeling uninspired, and overall job dissatisfaction. One way to keep veteran teachers engaged is through continued mentoring. Yet current mentoring programs vary in scope, often focus too heavily on one-to-one talk, with mentors serving as therapists, and generally fail to include veteran teachers. Considering this is not how schools operate, we argue active mentoring for veteran teachers is best when embedded into regular school practice. Collaborative mentoring, as we have termed it, pairs experienced high school teachers with other veteran colleagues, including university professors, in professional development activities centering on improving classroom practices. We believe that collaborative mentoring holds potential to meet the needs of all stakeholders—high school students for support in learning laboratory and writing skills; university faculty for hands-on classroom work and reflective practice, as well as for sharing content and pedagogical knowledge with professionals in the field; and, specifically, veteran biology teachers for expanding access to meaningful professional development opportunities. Focusing on applicable classroom pedagogy serves as a cost-effective model for professional development for veteran teachers, possibly increasing job satisfaction and teacher retention in high schools across the nation.

INTRODUCTION

There is an abundance of research surrounding the needs of beginning teachers, yet very little is known about the particular needs of veteran teachers (1). Part of the issue stems from defining *veteran teacher*. Overall, the literature shows a lack of consensus with respect to the minimum length of service required to be considered a veteran teacher (2). However, what is known is that as teachers gain experience beyond the first one third of their career (approximately 7 to 10 years), students not only continue to make academic gains, they also make gains beyond test scores, including attendance improvements, fewer disciplinary offenses, increased time spent on reading for pleasure, and decreased time needed to complete homework (3). Examining student success in classrooms supervised by teachers beyond the first one third of their career, we define veteran teachers by this standard.

Besides length of service, veteran teachers are also defined by their degree of expertise in their content area, as well as their commitment to continued professional development (4). Considering the need to keep experienced biology teachers in the classroom, mentoring holds promise in providing personalized, content-driven professional development to veteran biology teachers as a way to strengthen productivity and increase job satisfaction (5). It is known that mentoring programs have improved teacher retention rates in K–12 education (6–9; http://grad.uw.edu/for-students-and-post-docs/core-programs/mentoring/). However, despite improved teacher retention rates, mentoring successes vary among teachers—something that may be attributed to the fact that mentoring programs differ from state to state, even district to district (10, 11). Moreover, teacher-mentoring programs vary in scope and often result in little support to continue developing teachers as they become more experienced in the classroom. Failure to provide ongoing support for experienced teachers can lead to burnout, job dissatisfaction, feeling unfulfilled in career progress, and attrition (10, 12). In addition, many teacher-mentoring programs are limited due to insufficient mentoring between teachers in the shared field of expertise, particularly in science and math (6). Lastly, many mentoring programs often focus too heavily on one-to-one talk, much like a therapeutic relationship (therapist and client), which

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is highly unlike the way schools operate (13). In light of the drawbacks of current teacher-mentoring models, there is good reason to believe that embedding mentoring into regular school practice can be extremely beneficial, particularly when the mentoring interactions allow for mentors and mentees to be engaged in joint projects, modeling for each other their approaches to interactions with students.

COLLABORATIVE MENTORING

Collaborative mentoring techniques generally begin with modeling of new techniques or strategies, followed by implementation and adaption of the technique(s) for pedagogical use, and, finally, independent implementation of the technique in the classroom (14). As a tool, collaborative mentoring holds great promise in preventing veteran biology teacher attrition because 1) the practice considers participants equals in the process—with all involved parties demonstrating their practical knowledge while simultaneously providing encouragement to one another as the mentoring relationship evolves—and 2) the strategies can be implemented as part of everyday practice, such as in the classroom setting (15, 16). Several models can provide collaborative mentoring for veteran biology teachers.

In-house collaborative mentoring

In-house collaborative mentoring recognizes how rich mentoring experiences, bidirectional mentoring relationships, and multiple mentoring opportunities can be provided to participants by using the existing programs and abundance of expertise already present in the academic institution (17). An in-house collaborative mentoring platform can offer veteran biology teachers professional development activities centering on publication tips, committee work, presentation opportunities, and journal reading groups. Considering that many biology teachers have entered teaching as a second career, the topics offered during in-house collaborative mentoring meetings can be used to keep veteran biology teachers engaged with the content while also renewing their commitment to teaching and learning (18).

Faculty learning communities

Faculty learning communities (FLCs) are another form of collaborative mentoring, involving community engagement centered on student and faculty learning, demonstrating that academic institutions are places focused on continued learning (19). Faculty learning communities in schools are subdivided into topic-based groups and cohort-based groups (20). Cohort-based FLCs typically consist of faculty or staff who have been affected by "isolation, fragmentation, stress, neglect, or a chilly academic climate," whereas topic-based FLCs are composed of faculty and staff who aim to address "campus teaching and learning needs, issues, or opportunities" (20). This dual model system is beneficial to schools because it offers veteran teachers autonomy in choosing the professional development opportunity that best suits their particular needs.

Mentoring circles

"Mentoring circles typically involve one mentor working with a group of mentees or groups of people mentoring each other" (21). In mentoring circles, a facilitator keeps the group focused. Moreover, mentoring circles can be composed of faculty with shared expertise. This form of collaborative mentoring is particularly beneficial for veteran biology teachers because it not only allows for increased access to content knowledge, it can also reduce feelings of isolation and reaffirm veteran teachers' commitment to teaching and learning.

Vertical collaborative mentoring

The collaborative mentoring platform we are most familiar with is vertical collaborative mentoring. Vertical collaborative mentoring involves a collaborative mentorship between experienced high school biology teachers and professors from a local university—working together to provide guided-inquiry explorations and manuscript publications for high school students in an introductory microbiology course. Through this platform, students participate in scientific discourse with professionals in the field, receiving guidance in choosing research topics that align with their experience level and potentially contributing to a more substantial learning experience for the student (11, 22). Authentic learning activities align with the Next Generation Science Standards (NGSS) seeking to improve scientific literacy and strengthen student's 21st-century science learning skills (23–25). For experienced biology teachers, since they have different professional development needs from those of novice educators, collaborative mentoring with an "expert" in academia helps develop the professional skills of a veteran teacher (26, 27). The collaborative experience between teachers with shared expertise grants veteran teachers the opportunity to reflect more thoughtfully on their current teaching practice and allows for personalized professional development within their subject area (5). For example, collaborative mentoring between university faculty and high school teachers, using guided-inquiry explorations in science, can be used to develop a poster for presentation at a professional conference (28). In some states, presentations at professional conferences qualify as high-quality professional development (HQPD) (Massachusetts Department of Elementary and Secondary Education, http://www.doe.mass.edu/pd/faq.html#A1). Lastly, collaboration between high schools and universities creates strong professional learning communities (PLCs) centering on pedagogical practices best supporting student learning, particularly through the transition from high school to college (29).

Case in point

Student mentoring experience. Students enrolled in a high school introductory microbiology course were presented the opportunity to continue exploring the field of microbiology through conducting guided-inquiry projects of their choosing. The research for these projects occurred outside of school hours. Fourteen out of 49 students chose to participate in the additional research experience. Assessment of student learning would be evident through 1) manuscript construction for publication in a peer-reviewed high school science journal, 2) survey data, and 3) comparing final grades between students who performed research versus students who did not complete guided-inquiry outside of the microbiology course (see Appendix 1). Meetings between the research students and two professors from the University of Massachusetts Lowell Biological Science Department occurred prior to the start of student experimentation. The first meeting between students and university mentors centered on students developing scientifically sound investigation protocols. Once the university mentors approved the student's protocols, the investigations began. The second meeting between students and university mentors focused on teaching students how to construct manuscripts for publication. Figure 1 shows the procedure used for mentoring the students in performing their research and constructing the manuscript.

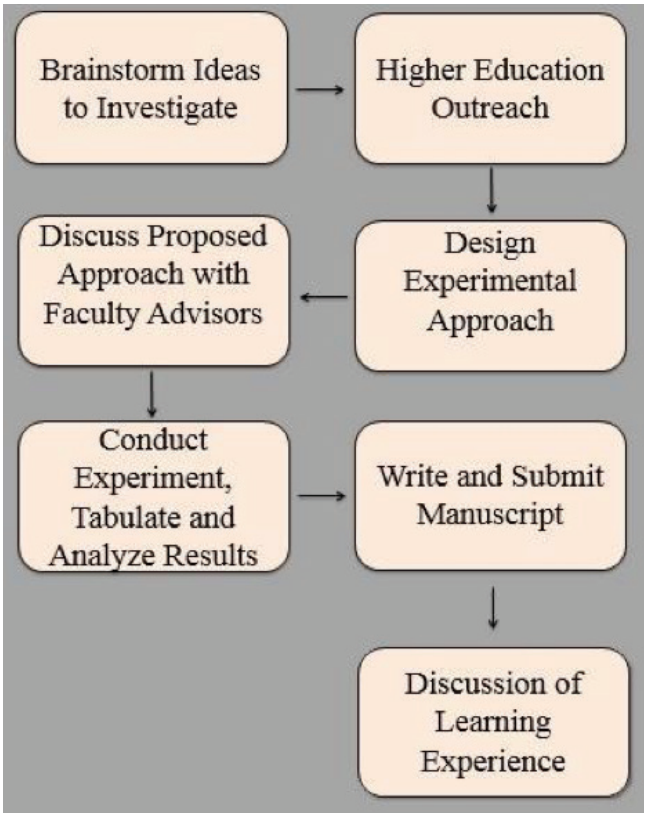

FIGURE 1. Experimental design of student-led guided-inquiry investigations.

Veteran teacher mentoring evolution. The role of the veteran teacher during the student's guided-inquiry explorations was to assist students in completing their experiments, help students with data analyses, guide students in manuscript development, and arrange consultations between students and university professors, as needed, to ensure accuracy of the student work. Upon realizing the uniqueness of this experience for high school students, the veteran biology teacher and one of the university professors developed a separate mentorship in order to produce an abstract and poster for presentation at the American Society for Microbiology national academic conference (30). Figure 2 highlights a broad mentoring process that can be used between veteran teachers and university mentors.

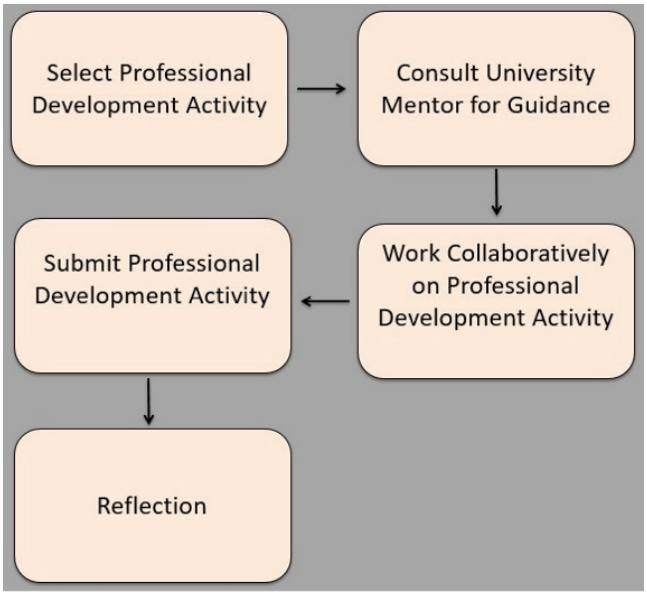

FIGURE 2. Veteran teacher mentoring.

IMPLICATIONS FOR TEACHING AND LEARNING

Collaborative mentoring using the proposed models holds promise in developing students, veteran biology teachers, and university faculty through the creation of PLCs (29). Professional learning communities are beneficial because they allow for nurturing, guidance, and engagement when constructing one's own learning (31). In particular, collaborative mentoring may benefit veteran teachers more than other forms of professional development—which are generally limited to attending mandate meetings, participating in in-house presentations on programs that often cannot be effectively implemented in a biology classroom, or taking graduate-level biology courses, which keep veteran teachers current in the field but do not contribute to classroom practice. This is because, with collaborative mentoring, the veteran biology teacher is placed in the role of student. As such, veteran teachers increase content knowledge, further develop professional skills, and improve classroom pedagogy

(32). Furthermore, collaborative mentoring can be "locally grown," meaning these models could be easily embedded into high schools, particularly those that reside in the same locale as higher education institutions. Incorporating a working relationship between neighboring academic establishments may make it possible for students to experience smoother transitions as they progress from high school to college. Further analyses along these lines are warranted. Moreover, collaborative mentoring provides veteran biology teachers with cost-effective access to high-quality professional development (Massachusetts Department of Elementary and Secondary Education, http://www.doe.mass.edu/pd/faq.html#A1, 33). It must also be noted that there are known benefits to the mentors of veteran biology teachers, such as improved cognitive skills, increased reflective practice, renewed energy for the teaching profession, and an overall improvement in self-esteem as an effective educator (34).

LIMITATIONS

Time constraints, monetary availability, scarcity of face-to-face contact time, and incompatibility between collaborating faculties are all obstacles that can interfere with collaborative mentoring. While these limitations are not easily overcome, their burden can be diminished. With respect to the vertical collaborative mentoring model, monetary support can be acquired through donations from biotechnology companies, or donation sites. Donation sites function to provide schools the necessary tools to encourage independent, student-led learning projects to flourish (http://www.donorschoose.org/). Through this mission, many donation sites pair with school supply companies, thereby ensuring requested supplies are high-quality. One limitation of the vertical collaborative mentoring model is that it requires extra time, and, in most situations, this extra time would be in addition to a normal workload. Overworked teachers and/or those already at full capacity may find it difficult to sustain the requisite extra effort. However, for those veteran teachers interested in pursuing vertical collaborative mentoring, time constraints can be lessened by doing the work outside of school hours, as was done with the highlighted project. The work could also be done as an activity for a school-supported club. Furthermore, it should be considered whether a research methods course should be implemented in high schools. This could be accomplished through funding by the National Science Foundation (Discovery research preK–12 (DRK–12), 2012 https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=500047). Implementing new courses requires creating new curricula and possibly seeking grant funding or additional ways to offer HQPD for veteran teachers (Massachusetts Department of Elementary and Secondary Education, 2012, http://www.doe.mass.edu/pd/faq.html#A1).

When face-to-face meetings are impractical during school hours, E-mentoring collaborations are possible (35). E-mentoring uses e-mail or computer-video conferencing tools in order to allow mentors and mentees to develop important content-driven support systems without regard to geographical constraints. Perhaps the most challenging obstacle to overcome is ensuring mentors and mentees have a functional relationship. Good mentoring relationships require "reciprocity, mutual respect, clear expectations, personal connection, and shared values" (36). We recommend pairing veteran secondary biology teachers with faculty with whom a known working relationship is firmly established to ensure a respectful academic relationship between parties.

CONCLUSION

Veteran biology teachers' professional development needs are more unique and diverse than those of beginning biology teachers, where a one-size-fits-all approach can be useful for addressing many topics. Considering this information, it is imperative that schools keep a vested interest in their veteran teachers because, without proper motivational strategies, schools become at risk of losing experienced educators due to burnout, dissatisfaction, and feeling underchallenged (37, 38). While there are many ways to respond to the needs of veteran biology teachers, we believe that offering experienced educators ownership in creating their own personalized professional development opportunities will keep them passionate about their work (39). Collaborative mentoring can be a form of meaningful, content-specific professional development for veteran biology teachers. The models we present are beneficial to veteran biology teachers because the design of these learning experiences challenges the veteran teacher's pedagogical knowledge through transformative and measurable learning experiences (40). Strengthening a veteran biology teacher's confidence in academic content, pedagogical skills, collegial relationships, and autonomy over the direction of their career all closely link to improving teacher satisfaction, self-efficacy, and most importantly, retention (6, 41, 42).

SUPPLEMENTAL MATERIALS

Appendix 1: Student mentoring experience data

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